

PAM2011 – Semester II Practice Questions

1. A certain type of cell has a radiation response that follows the **multi-target single-hit model** with 4 target molecules. Beyond the threshold dose, an average dose of 50 mGy is required to reduce the cell population to 37% of its original population. What fraction of the cell population would survive a dose of 60 mGy?  
[10]
2. Discuss the following terms in relation to measurement of Absorbed Dose (i) Absolute Standards, (ii) Secondary, and (iii) Standards Substandard. [6]
3. Why are Absolute Standards of Absorbed Dose rarely used to measure radiation dose? [5]
4. Why is the radiolysis of water a significant factor in radiobiology? [5]
5. Explain why Dose-equivalent limits are not a boundary between safety and danger. [5]
6. When rats are irradiated with 200 kVp x-rays, 50 Gy is required to produce death. If similar rats are irradiated with 10M-eV proton, only 12.5 Gy is needed. Show that the RBE of the protons is 4? [5]
7. Show that a 3dB loss is approximately equal to 50%. [5]
8. Does Relative Biological Effectiveness (RBE) increase or decrease with Linear Energy Transfer (LET)? [1]
9. Under what conditions would a radiation worker require an electronic (solid state) personnel monitoring device? [3]
10. Explain why air is a useful medium in which to perform dosimetry. [2]
11. Explain why Absorbed Dose, Dose equivalent and Effect Dose all have the same SI units. [5]
12. Using numerical examples, demonstrate how the number of target molecules affects a cell culture's ability to sustain sub-lethal damage and recover from a radiation dose. [20]